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Upgradeability of Solar, Rock and Vacuum Evaporated Salts

Paper classification: Salt physical properties

Abstract

Since several decades, Salt Partners have been building salt purification, salt upgrading and salt refining plants. In this connection, Salt Partners have developed a salt testing methodology – called salt upgradeability test - that simulates the sequence of unit operations employed in various salt processes. The results of the tests have been used to assess the economy of salt processing, to guarantee the performance and to prove the purification efficiency of the implemented salt processing plants. Salt Partners have retained the samples of the raw and tested salt and compiled the analytical results. All samples were analysed for Ca, Mg, SO4, insolubles and water. Some samples were analysed also for components of interest to the membrane chloralkali electrolysis and special applications, such as Al, As, Ba, Br, Cd, Co, Cr, Cu, F, Fe, Hg, I, K, Li, Mg, Mn, Mo, N, Ni, P, Pb, Si, Sr, Ti, TOC, V and Zn. Altogether, Salt Partners avail of more than 2'000 tested salt samples and more than 10'000 individual sets of analytical results.

In this paper, the upgradeability test apparatus and testing methods are described. The methods of chemical analysis, the calculation of salt components and the resulting NaCl purity are described. The results are published in a table form, together with country of origin and the type of salt and upgradeability test. Where permission was given by the source, the samples have been identified with the name of the producer and the saltworks. Otherwise the samples have been anonymised. The data populations were analysed according to salt types, geographic regions, production and processing methods, including biological saltworks management. The data analyses include the usual statistical values, such as average, maximum, minimum, standard deviation, etc. The data analyses are presented in a numerical and graphical form and discussed from the point of view of whether or not it is possible to predict the processed salt quality on the bases of raw salt analysis, location of the salt source, etc. The term of salt upgradeability as a physical property of salt is explained and illustrated on selected examples as a graph called upgradeability curve. The use of the upgradeability curve for determination of the most economical salt upgrading process, for example for chloralkali electrolysis, is demonstrated. The term "Salt quality according to Australian Standard" and the importance of constant quality of salt for use in caustic / chlorine manufacture are explained. The paper is illustrated with several coloured photographs of salt crystals observed under mineralogical microscope in phase shifted polarised light, which reveals impurities such as gypsum, astrakanite, bitter salt, etc.

Keywords: Upgradeability, Impurities, Quality, Processing, Global Data